

Sleep Disorders in Preschoolers: Prevalence and Comorbidity with Psychiatric Symptoms

Silje Steinsbekk, PhD,*† Turid S. Berg-Nielsen, PhD,‡ Lars Wichstrøm, PhD*§

ABSTRACT: *Objectives:* This study provide data on the prevalence of diagnosable sleep disorders in preschoolers and examined the relationship between specific sleep disorders and a range of DSM-4–defined psychiatric symptoms. *Methods:* All children born in 2003 or 2004 in Trondheim, Norway, who attended regular community health checkups for 4 year olds were asked to participate (97.2% attendance; 82.0% consent rate, N = 2475). A screen-stratified subsample of 1250 children was recruited to participate in an additional comprehensive study that included a structured diagnostic interview (the Preschool-Age Psychiatric Assessment). Nine hundred ninety-five parents (79.6%) completed the interview. *Results:* The estimated sleep disorder rate was 19.2%. Rates of specific disorders were as follows: primary insomnia (16.6%), primary hypersomnia (0.8%), nightmare disorder (2.2%), and sleepwalking disorder (0.7%). When adjusted for a range of common psychiatric symptoms, primary insomnia was specifically related to symptoms of depression, generalized anxiety disorder, separation anxiety, and specific phobia. When sleep problems were excluded as a symptom of depression, the association between depression and primary insomnia was no longer significant. Nightmare disorder was significantly related to generalized anxiety disorder. *Conclusions:* This first study of the prevalence and comorbidity of diagnosable sleep disorders in preschoolers indicates that primary insomnia is common in young children, whereas other sleep disorders are rare. Sleep disorders are related to psychiatric symptoms, particularly symptoms of anxiety disorders.

(*J Dev Behav Pediatr* 0:1–9, 2013) **Index terms:** sleep disorders, insomnia, psychiatric disorders, anxiety, depression.

A large body of research has found that sleep problems are prevalent in childhood, with rates ranging from 20% to 40%.^{1,2} However, diagnosable dyssomnias (e.g., insomnia and hypersomnia) and parasomnias (e.g., nightmare disorder and sleepwalking) have received far less attention. Meltzer et al³ examined the prevalence of sleep disorders diagnosed by primary care pediatricians and reported rates that ranged from 0.004% (hypersomnia) to 0.05% (parasomnia). Petit et al⁴ found dyssomnias and parasomnias to be prevalent in 9.2% to 84.4% of the subjects in a large preschool sample, but these numbers are not based on DSM-4– or ICD-10–defined sleep disorders. Regarding older children, to the best of our knowledge, only 2 population studies have examined diagnostically defined sleep disorders, both

based on adolescent samples.^{5,6} Because sleep problems have different presentations and rates at different ages,^{4,6} the rate of sleep disorders will probably also differ according to age. Sleep problems seem to be quite common during preschool years,⁴ but no study has examined the prevalence of diagnosable sleep disorders in the general population of preschoolers. Therefore, the first aim of this study was to provide these prevalence data by examining a large community sample of children using a state-of-the art diagnostic interview.

Although the relationship between sleep and mental health problems in children has received considerable attention,^{7,8} no study has examined the comorbidity of diagnostically defined sleep disorders and mental health problems in younger children. Sleep problems, however, in older children are associated with impaired cognitive performance,⁹ medical health problems,¹⁰ and a number of psychiatric disorders such as anxiety,¹¹ depression,⁸ and attention-deficit hyperactivity disorder (ADHD).¹² The comorbidity of psychiatric symptomatology and sleep problems may result in a more negative course of development and greater impairment compared with sleep disorders without such comorbidity,^{13,14} and treatment of sleep problems has been shown to positively influence behavioral problems.¹⁵ Understanding the co-occurrence of difficulties is also necessary to recognize developmental trajectories and aid researchers and clinicians in identifying, preventing, and treating sleep problems.⁷ A few studies have examined the

From the *Department of Psychology, Norwegian University of Science and Technology (NTNU), Trondheim, Norway; †Department of Child and Adolescent Psychiatry, St. Olav's University Hospital, Trondheim, Norway; ‡Faculty of Medicine, Norwegian University of Science and Technology (NTNU), Trondheim, Norway; §NTNU Samfunnsforskning AS, Trondheim, Norway.

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Address for reprints: Silje Steinsbekk, PhD, Department of Psychology, Norwegian University of Science and Technology, 7491 Trondheim, Norway; e-mail: Silje.Steinsbekk@svt.ntnu.no.

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association between sleep problems and behavioral problems in young children,^{16,17} but this research explored broad categories of mental health difficulties using scale scores rather than specific psychiatric symptoms. One exception is the study by Willoughby et al,¹⁸ who examined the association between ADHD symptomatology and parent-reported symptoms of sleep problems in a pediatric preschool sample. They found that, although there was an association between ADHD and sleep problems, it was not significant after adjusting for additional psychiatric symptoms. However, symptoms of sleep problems do not necessarily translate into diagnostically defined sleep disorders. Moreover, because studies of older children^{7,12} and adults¹⁹ show that specific sleep problems are associated with specific behavioral and emotional problems, it is reasonable to assume that specific sleep disorders might also be related to specific psychiatric symptoms in preschoolers. Therefore, we seek to extend the research by Willoughby et al¹⁸ by examining the co-occurrence of specific dyssomnias (primary insomnia and hypersomnia) and parasomnias (nightmare and sleepwalking), in addition to the DSM-4-defined symptoms of the most prevalent psychiatric disorders among a large community sample of preschoolers. Thus, this study addresses 2 important gaps in pediatric sleep research: the lack of data concerning the prevalence of diagnostically defined sleep disorders in preschoolers and the comorbidity between symptoms of specific sleep disorders and psychiatric symptoms.

METHODS

Participants and Recruitment

All children born in 2003 or 2004 whose parents lived in Trondheim, Norway, were invited to participate in the Trondheim Early Secure Study. A letter of invitation together with the Strengths and Difficulties Question-

naire (SDQ) 4-16 version²⁰ was sent to their homes. The parents brought in the completed SDQ when attending the scheduled health checkup for 4 year olds. A flow-chart describing recruitment procedure and participation rates is depicted in Figure 1.

The sample can be defined as a community sample, because almost everyone who was eligible for the study appeared at the city's well-child clinics. Because mental health problems are expected to be rare among preschoolers and because diagnostic interviews are time consuming and costly, a 2-stage sampling design with screening (screen-stratified sampling) was adopted, which is more cost effective and provides more precise estimates than unstratified random sampling.²¹ The SDQ was used to screen children for mental health problems.²² The SDQ symptom scale scores (i.e., emotional symptoms, conduct problems, hyperactivity/inattention, and peer relationship problems) were divided into 4 strata using cutoff ranges of 0 to 4, 5 to 8, 9 to 11, and 12 to 40. Using a random number generator, 38.1%, 49.1%, 71.4%, and 89.2% children in strata 1 to 4, respectively, were selected to participate in the data collection. To oversample for mental health problems, these defined proportions of parents in each stratum were drawn to participate in a structured diagnostic interview.²³

We interviewed 995 (79.5%) parents of the 1250 invited to participate. Characteristics of the sample are presented in Table 1. The dropout rate after consenting at the well-child clinic did not differ across the 4 SDQ strata ($\chi^2 = 5.70$, $df = 3$, not significant) or by gender ($\chi^2 = 0.23$, $df = 1$, not significant).

Outcome Measures

Sleep Disorders

The Preschool Age Psychiatric Assessment (PAPA)²⁴ is a structured psychiatric interview completed by parents of 2- to 6-year-old children. The PAPA uses a structured

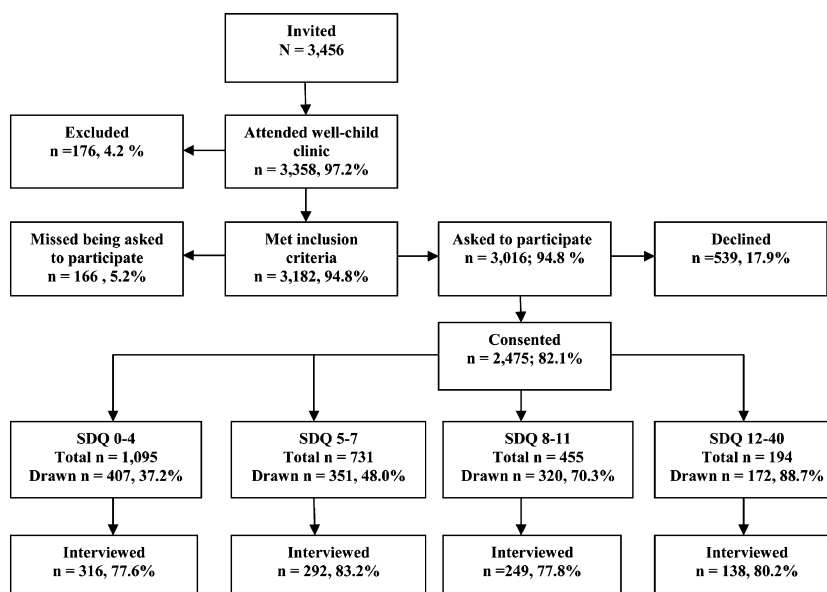


Figure 1. Sample recruitment.

Table 1. Sample Characteristics

Characteristic	%
Gender of child	
Male	49.1
Female	50.9
Gender of parent informant	
Male	15.2
Female	84.8
Ethnic origin of biological mother	
Norwegian	93.0
Western countries	2.7
Other countries	4.3
Ethnic origin of biological father	
Norwegian	91.0
Western countries	5.8
Other countries	3.2
Childcare	
Official daycare center	95.0
Other	5.0
Biological parents' marital status	
Married	56.3
Cohabiting > 6 mo	32.6
Separated	1.7
Divorced	6.8
Widowed	0.2
Cohabiting < 6 mo	1.1
Never lived together	1.3
Informant parents' socioeconomic status	
Leader	5.7
Professional, higher level	25.7
Professional, lower level	39.0
Formally skilled worker	26.0
Farmer/fisherman	0.5
Unskilled worker	3.1
Parents' highest completed education	
Not completed junior high school	0
Junior high school (10th grade)	0.6
Some education after junior high school	6.1
Senior high school (13th grade)	17.3
Some education after senior high school	3.4
Some college or university education	7.6
Bachelor degree	6.2
College degree (3–4 yr study)	33.6
Master degree or similar	20.3
PhD completed or ongoing	4.4
Households' gross annual income	
0–225K NOK (0–40K USD)	3.3
225–525K NOK (40–94K USD)	18.4

*(Table continues)***Table 1. Continued**

Characteristic	%
525–900K NOK (94–161K USD)	51.6
900K + NOK (161K + USD)	26.7
At least 1 parent has received treatment for mental health problems	
None	78.7
Outpatient only	19.0
Hospitalized	2.3
Parents received medical treatment for mental health problems	
No	87.4
Yes	12.6

K, 1000; NOK, Norwegian Kroner.

protocol with required questions and optional follow-up questions. The interviewer ensures that the interviewee understands the questions and provides clear information concerning the symptom at hand. A 3-month primary period is used. Based on information obtained in the PAPA interview, diagnoses of sleep disorders were generated by computer algorithms implementing the DSM-4²⁵ criteria, except for night walking disorder, which was defined according to the Anders criteria.²⁶ Among dyssomnias, we examined insomnia and hypersomnia, whereas among parasomnias, both nightmare disorder and sleepwalking disorder were included. Sleep terror disorder was not included because the PAPA interview only screened for night terror and did not fully cover the diagnostic criteria.

According to the DSM-4,²⁵ insomnia constitutes difficulties initiating or maintaining sleep or nonrestorative sleep. The DSM-4 criteria do not quantify what length of time before falling asleep qualifies for an insomnia symptom and do not specify a frequency of insomnia symptoms (i.e., times per week) during an episode of insomnia. Based on the DSM-4 though, Gaylor et al²⁷ have developed a classification of dyssomnias in younger children making a distinction among perturbation, disturbance, and disorder. According to their classification, using more than 20 minutes to fall asleep 5 to 7 times a week for at least 1 month signifies an onset sleep disorder for children older than 24 months. Johnson et al⁶ selected 4 times a week as the threshold for counting a symptom toward an episode of insomnia, a symptom frequency at which the majority of adolescents in their study began to report daytime impairment. Based on the DSM-4 criteria, in this study, primary insomnia was defined as (1) more than 30 minutes to fall asleep or using sleep medication; (2) 5 or more night awakenings (duration \geq 10 minutes) a week for at least 1 month; or (3) nonrestorative sleep: insufficiently rested after sleep or difficult to wake at least 3 times a week for at least 1 month. In the DSM-5, “resistance to going to bed” and “early awakenings” have been suggested as new criteria for the new insomnia disorder.²⁸ However, because less

than 0.5% of the current sample showed these suggested symptoms, such changes are not expected to affect the current results to any major extent. The DSM-4 defines hypersomnia as “excessive sleepiness for at least one month as evidenced by either prolonged sleep episodes or daytime sleep episodes that occur almost daily.”^{25(p 609)} The definition of prolonged sleep will depend on the typical amount of sleep in different age groups. In a meta-analysis of normal sleep patterns in children based on data from 20 different countries, the reference value of sleep duration in 4 to 5 year olds was 11.5 (hours/24 hours), and the upper range was 13.9 (mean + 1.96 × SD).²⁹ Because daytime sleep episodes are rare in 4 to 5 year olds²⁹ and there is no “nap time” for 4 year olds in Norwegian day-care centers, it is reasonable to equal these numbers to night sleep duration. Thus, based on the DSM-4 criteria and the findings of Galland et al,²⁹ the current study operationalized hypersomnia as (1) daytime sleep episodes (≥1 hour) at least 5 times a week; (2) daytime sleepiness at least 5 times a week for at least 1 month; or (3) usual night sleep duration exceeding 13.9 hours. A composite category of “any sleep disorder” consisting of insomnia, hypersomnia, nightmare disorder, and sleepwalking was included as well.

Interviewers (n = 7) had at least a bachelor’s degree in a relevant field and extensive prior experience in working with children and families. Nine percent (n = 89) of the interview audio recordings were recoded by blinded raters. The multivariate interrater reliabilities³⁰ were as follows: primary insomnia ($k = 0.90$), primary hypersomnia ($k = 0.78$), nightmare disorder ($k = 1.0$), and any sleep disorder ($k = 0.83$). Importantly, because certain disorders are relatively uncommon and the reliability sample was randomly drawn, the interviews contained only a few cases of children with certain sleep disorders. Hence, if raters disagreed on 2 of the 3 cases of primary hypersomnia included in the reliability sample, the interrater reliability was low. A few cases also yielded high interrater reliabilities when the raters agreed on an uncommon disorder (e.g., nightmare disorder).

Psychiatric Symptoms

The Preschool Age Psychiatric Assessment (PAPA) generates DSM-4 symptom counts of the most common psychiatric disorders in preschool. Included in the analyses were attention-deficit hyperactivity disorder (ADHD), conduct disorder (CD), oppositional defiant disorder (ODD), major depressive disorder, generalized anxiety disorder (GAD), separation anxiety, social phobia, and specific phobia. Symptom counts for psychiatric disorders rather than psychiatric diagnoses are used because we aim to examine the comorbidity between mental health and sleep disorders, and the combination of 2 rare conditions (psychiatric disorders and sleep disorders) would produce unsteady statistical estimates, that is, very large confidence intervals, and we would run the risk of presenting misleading odds ratios (ORs). The interrater reliabilities (intra-class correlation coefficients) between multiple pairs of blinded raters were ADHD = 0.97, CD = 0.89, ODD =

0.94, depression = 0.91, GAD = 0.94, separation anxiety = 0.90, social phobia = 0.94, and specific phobia = 0.79.

Because gender, socioeconomic status, and the child’s caregiving situation³¹ affect the prevalence of psychiatric disorders in preschoolers, we controlled for these factors in the regression analyses. Parental occupation was coded according to the International Classification of Occupations.³² If parents were living together, the parent with the highest occupation was chosen.

Statistical Analyses

The associations between sleep disorders and psychiatric symptoms were analyzed in 2 steps using complex samples logistic regression in PASW Statistics 18. First, crude odds ratios (OR) between the numbers of symptoms of psychiatric disorders and sleep disorders were calculated. Second, because of comorbidity between disorders, the effect of each psychiatric disorder symptom count was adjusted for symptoms of all other psychiatric disorders. The sample was screen stratified; therefore, analyses were conducted using the Horvitz-Thompson estimator with weights proportional to the inverse of the selection probability for each participant.

RESULTS

Prevalence

Table 2 displays the prevalence of different sleep disorders. As shown, primary insomnia was prevalent, whereas nightmare disorder was only moderately prevalent. Primary hypersomnia and sleepwalking were rare and, therefore, not analyzed further.

Comorbidity

As shown in Table 3, primary insomnia was associated with symptoms of all psychiatric disorders examined except for the 2 phobias. After adjusting for the symptoms of all disorders, the symptoms of depression, generalized anxiety disorder (GAD), and separation anxiety remained significantly associated with primary insomnia. Contrary to the bivariate results, the multivariate analyses also showed a significant relation between insomnia and specific phobia. Nightmare disorder, conversely, was related to symptoms of attention-deficit hyperactivity disorder (ADHD), separation anxiety, and GAD, but only GAD remained significant after adjusting for the presence of symptoms of the other disorders. The broad category of any sleep disorder was significantly related to all psychiatric conditions except from social and specific phobia. Depression, GAD, separation anxiety, and specific phobia predicted any sleep disorder after adjusting for each other.

According to the DSM-4, insomnia/hypersomnia constitutes 1 of the 9 criteria of major depression. To account for this symptom overlap, we computed a symptom count of depression in which the sleep-related symptom was excluded. The odds ratio (OR) of this depression variable predicting insomnia was virtually

Table 2. Total and Gender-Specific Rates of Sleep Disorders in 4-year-old Children

Sleep Disorders	Total (N = 995), % (CI)	Boys (N = 489), % (CI)	Girls (N = 506), % (CI)	χ^2	<i>p</i>
Primary insomnia	16.6 (15.0–18.4)	15.3 (13.2–17.6)	18.0 (15.7–20.6)	1.36	.11
Primary hypersomnia	0.8 (0.5–1.3)	1.1 (0.6–2.0)	0.5 (0.2–1.0)	1.20	.08
Nightmare disorder	2.2 (1.7–2.9)	1.5 (1.1–2.1)	2.9 (2.0–4.2)	2.22	.01
Sleep walking	0.7 (0.5–1.2)	0.8 (0.4–1.6)	0.7 (0.4–1.4)	0.01	.89
Any sleep disorder	19.2 (17.5–21.1)	17.4 (15.1–19.8)	21.1 (18.6–23.9)	2.30	.04

identical to the OR with insomnia/hypersomnia included in the depression symptom count in the original analysis. However, after adjusting for symptoms of the other psychiatric disorders, the relationship between primary insomnia and the new depression variable was no longer significant (OR = 0.92; CI = 0.72–1.17; *p* = .50). The association between the new depression variable and nightmare disorder did not substantially differ from the original results, but the relationship between the new depression variable and the composite category of any sleep disorder became nonsignificant (OR = 0.91; CI = 0.72–1.15; *p* = .42).

DISCUSSION

The prevalence and comorbidity of sleep disorders and symptoms of psychiatric disorders were examined in a large community sample of Norwegian 4 year olds. Almost 20% of the sample had a diagnosable sleep disorder, and the prevalence for each of the disorders examined ranged from 0.7% to 17%, with primary insomnia being the most prevalent. **Primary insomnia was related to symptoms of depression, generalized anxiety disorder (GAD), separation anxiety, and specific phobia when we adjusted for all of the symptoms of psychiatric disorders. Notably, however, the relationship between depression and primary insomnia was no longer evident when the sleep-related symptom of depression was excluded. Nightmare disorder was related to GAD and separation anxiety. Because of the low prevalence of hypersomnia and sleepwalking, the comorbidity between these 2 disorders and symptoms of psychiatric disorders were not examined,** but they were included in the composite category of any sleep disorder. Any sleep disorder was significantly related to symptoms of depression, GAD, separation anxiety, and specific phobia when we adjusted for the other conditions. As with primary insomnia, the relationship between depression and any sleep disorder was no longer significant when the sleep-related item of depression was no longer included. In summary, sleep disorders in 4-year-old children seem particularly associated symptoms of anxiety disorders.

The difference in prevalence between the current and earlier studies is moderate and can at least partly be accounted for by the use of parent questionnaires to assess sleep problems in earlier studies versus interview-based diagnostically defined sleep disorders in the current

study. Comparable numbers are those reported by Gehrman et al³³ who examined insomnia symptoms in youth based on a semistructured interview. They found a prevalence of 19.5% and 6.6% based on self-report and parent-report, respectively. Petit et al⁴ found that 16.9% of the 4 year olds had sleep-onset difficulties, whereas 25.5% reported night-awakenings, constituting 2 of the 3 main symptoms of insomnia. It should be noted that, however, the current findings suggest sleep disorders to be far more prevalent in young children compared with the rates reported by primary care providers, with numbers ranging from 0.004% (hypersomnia) to 0.05% (parasomnia).³ Thus, importantly, the current findings suggest that sleep disorders are grossly underdiagnosed in primary care. If sleep disorders are not recognized, they are unlikely to be treated. Because sleep problems may significantly and negatively affect health and functioning if left untreated,³⁴ not acknowledging the presence of a disorder might have serious consequences for the young child.

This study adds to earlier research by examining the associations between the symptoms of a range of psychiatric disorders and diagnostically defined sleep disorders. The findings suggest sleep disorders to be related to symptoms of specific psychiatric disorders, particularly anxiety disorders. Previous studies of clinical samples of children (aged 6 to 17 years) with anxiety found that sleep problems were related to GAD and separation anxiety.¹¹ This is in accordance with the results of the current study of preschoolers. Insomnia is one of the core complaints of GAD in adults,³⁵ and central nervous system hypervigilance and hyperarousal caused by GAD itself might explain the comorbidity.³⁶ Anxiety in general promotes vigilance and alertness, and because sleep and vigilance represent opposite processes at a neurobiological level,³⁷ anxiety may cause problems initiating and staying asleep. Insomnia was also significantly related to symptoms of separation anxiety in this study, confirming the findings of Petit et al⁴ If a child with separation anxiety experiences the threat of separation when going to bed alone, an increase in arousal is triggered.³⁸ This vigilance may interfere with the feeling of safety needed to initiate sleep,³⁹ which might explain the relationship between insomnia and separation anxiety symptoms.

Previous research has shown that sleep disruptions are more frequently related to depression as age increases⁴⁰; however, this study found an association between symptoms of depression and insomnia in 4-year-old children. It

Table 3. Associations Between Sleep Disorders and Symptom Counts of Common Psychiatric Disorders Among 4-year-old Children

No. DSM-4 Symptoms (Possible Range)	Mean No. Symptoms, Mean (95% CI)	Primary Insomnia		Nightmare Disorder		Any Sleep Disorder	
		OR (95% CI), <i>p</i>	Adj. OR (95% CI), <i>p</i>	OR (95% CI), <i>p</i>	Adj. OR (95% CI), <i>p</i>	OR (95% CI), <i>p</i>	Adj. OR (95% CI), <i>p</i>
Attention-deficit hyperactivity disorder (0–18)	1.22 (1.14–1.29)	1.16 (1.11–1.22), <.001	0.95 (0.89–1.02), .16	1.18 (1.09–1.27), <.001	1.09 (0.99–1.21), .09	1.18 (1.12–1.23), <.001	1.00 (0.92–1.04), .45
Conduct disorder (0–9)	0.33 (0.30–0.36)	1.42 (1.20–1.69), <.001	1.17 (0.95–1.43), .14	1.32 (0.95–1.85), .10	1.16 (0.83–1.61), .39	1.42 (1.21–1.67), <.001	1.19 (0.98–1.44), .08
Oppositional defiant disorder (0–8)	0.74 (0.69–0.79)	1.30 (1.18–1.43), <.001	0.99 (0.87–1.12), .85	1.12 (0.93–1.35), .22	0.91 (0.73–1.14), .40	1.28 (1.17–1.40), <.001	0.97 (0.86–1.09), .58
Major depressive disorder (0–11)	0.47 (0.44–0.51)	2.33 (1.98–2.74), <.001	1.78 (1.46–2.17), <.001	1.28 (0.93–1.76), .14	0.68 (0.41–1.19), .13	2.23 (1.96–2.70), <.001	1.74 (1.43–2.12), <.001
Generalized anxiety disorder (0–6)	0.47 (0.43–0.50)	2.33 (1.99–2.73), <.001	1.87 (1.54–2.28), <.001	2.02 (1.59–2.56), <.001	2.14 (1.55–2.94), <.001	2.36 (2.01–2.76), <.001	1.84 (1.52–2.24), <.001
Separation anxiety disorder (0–8)	0.31 (0.28–0.33)	1.48 (1.24–1.75), <.001	1.23 (1.01–1.48), .04	1.52 (1.18–1.95), .001	1.24 (0.92–1.66), .15	1.50 (1.27–1.76), <.001	1.26 (1.05–1.51), .02
Social phobia (0–2)	0.02 (0.01–0.02)	1.06 (0.46–2.44), .89	0.48 (0.10–2.34), .37	1.82 (0.69–4.78), .23	1.03 (0.47–2.25), .94	1.63 (0.92–2.89), .10	0.94 (0.29–3.09), .92
Specific phobia (0–7)	0.09 (0.07–0.11)	0.98 (0.68–1.43), .93	0.59 (0.38–0.91), .02	1.20 (0.70–2.04), .51	0.70 (0.38–1.28), .25	0.91 (0.64–1.31), .61	0.54 (0.36–0.80), <.01

should be noted that although this comorbidity was explained by the overlap of symptoms for insomnia in combination with depression's comorbidity with other psychiatric disorders, that is, once the sleep disruption criterion of depression was removed from the analysis and comorbid psychiatric disorders controlled, the relationship between depression and insomnia was no longer evident. This finding does not indicate that sleep problems should be excluded as a symptom of depression in young children but simply illustrates that circularity might partially account for the association found between depression and insomnia. To the best of our knowledge, earlier checklist and interview studies have not accounted for this overlap in symptoms between insomnia and depression. The current results, however, are in line with studies using objective sleep measures, which find that children with depression do not differ from controls with regard to sleep disruptions.⁴¹ Such studies have been rare, and replications are obviously needed before any firm conclusions can be drawn regarding the depression-sleep relationship in preschool children.

Nightmare disorder, which is characterized by the recurrence of frightening dreams and stressful awakenings,²⁵ was specifically related to symptoms of GAD in this study. This finding fits the view that nightmares are etiologically linked to daytime anxiety.⁴² The empirical link between nightmares and GAD has previously been found in adolescents⁴³ but has never been reported in young children. Nightmares are vivid and highly emotional; as such, they might be the output of a heightened emotion distress system.⁴⁴ In their neurocognitive model of dreaming, Levin and Nielsen⁴⁵ suggested that nightmares reflect failures of emotion regulation. Excessive worries, a core characteristic of GAD,²⁵ may be a failed attempt to cope with a threat or danger,⁴⁶ thereby reflecting emotional dysregulation. It has also been suggested that at least some of the relationship between GAD and nightmares might be caused by common genes, although the 2 conditions have largely independent genetic influences.⁴⁷

In accordance with earlier studies of school children,⁴⁸ the current findings suggest sleep disorder to be more strongly associated with symptoms of anxiety than symptoms of depression in young children. Notably, however, anxiety is an early-onset disorder, whereas depression usually occurs later in life; in addition, anxiety is often a precursor to later depression.⁴⁹ Nevertheless, it has been shown that the comorbidity of psychiatric conditions and sleep problems may result in a more negative course of development and greater impairment than sleep disorders without such comorbidity.¹⁴ Given that the defined symptoms for these disorders in the DSM-4 are numerous (e.g., attention-deficit hyperactivity disorder [ADHD] has 18 symptoms; separation anxiety has 8 symptoms; and major depression has 11 symptoms), a 20% to 80% increase in the odds of having a specific sleep disorder in response to

each psychiatric symptom is not trivial. From this perspective, the magnitude of the associations could be of clinical significance; of particular significance is the relationship found between anxiety symptoms and the 2 most prevalent sleep disorders, insomnia and nightmare disorder. First, if presented with an anxious child, the pediatrician should thus examine for sleep problems. Second, if insomnia or nightmare is reported in young children, anxiety symptoms also need to be examined.

Limitations

The current sample consisted of community children and, therefore, permits a greater generalization of findings than studies that have examined clinical samples. Despite the relatively high education level of the parents, the sample was representative in terms of parental income and child caregiving situation with respect to the population of parents of 4 year olds from which it was drawn and to the national average.^{50,51} Although the prevalence of sleep problems in preschoolers does not seem to differ substantially between Scandinavian countries and non-Scandinavian countries,^{52,53} except from the register study by Meltzer et al,³ the prevalence rates of diagnosable psychiatric disorders are lower in Norway than in many other countries (e.g., the United States).³¹ Therefore, generalizing these findings to other Scandinavian countries seems warranted, but they may not necessarily generalize to countries with higher rates of mental health problems. In addition, cultural variations in napping, bedtime, bedtime routines, and so on, may limit the generalizability of the findings.⁵⁴

It should also be noted that we used symptom counts rather than psychiatric diagnoses. Therefore, the current results may not generalize to diagnosable psychiatric disorders in which impairment and duration criteria are used. The reliance on parental reports is another limitation of the present research. Because parents reported both sleep and psychiatric conditions, common method variance may account for some of the comorbidity. However, it should be underlined that our diagnostic manual, the Preschool Age Psychiatric Assessment (PAPA), is an interviewer-based measure, which implies that the interviewer decides whether the symptoms is present or not and probes until she or he can make a decision. Nonetheless, objective measures of sleep should ideally be applied; however, the use of video recordings, actigraphy, or polysomniography is unfortunately too time and cost consuming to be used in large-scale community studies such as this one. Furthermore, the value of these methods in determining several sleep disorders, such as nightmares and dyssomnias, may be limited. However, the use of diagnostic definitions of sleep disorders rather than parent questionnaires is a strength of the current study. Using the DSM-4 criteria rather than sleep questionnaires are preferable because these criteria are more precise and correspond to a decision-making diagnosis.¹⁹ Notably, however, the PAPA interview only screens for night terror and does not fully covers the diagnostic criteria.

The inability to diagnose night terror is a clear disadvantage of this study.

Summary and Conclusion

This study is the first to report the prevalence of diagnosable sleep disorders in a large population sample of 4-year-old children and presents new knowledge concerning the specificity of the relationship between sleep disorders and psychiatric disorders. The results indicate that **insomnia is common in young children and that both insomnia and nightmare disorders are specifically associated with symptoms of anxiety**. Because the current findings suggest that sleep disorders are underdiagnosed in pediatric practices,³ the results emphasize the need to routinely check for sleep disorders and co-occurring psychiatric symptoms in children.

REFERENCES

1. Kahn A, Vandemerck C, Rebuffat E, et al. Sleep problems in healthy preadolescents. *Pediatrics*. 1989;84:542-546.
2. Owens JA, Spirito A, McGuinn M, et al. Sleep habits and sleep disturbance in elementary school-aged children. *J Dev Behav Pediatr*. 2000;21:27-36.
3. Meltzer LJ, Johnson C, Crosette J, et al. Prevalence of diagnosed sleep disorders in pediatric primary care practices. *Pediatrics*. 2010;125:E1410-E1418.
4. Petit D, Touchette E, Tremblay RE, et al. Dyssomnias and parasomnias in early childhood. *Pediatrics*. 2007;119:E1016-E1025.
5. Ohayon MM, Roberts RE, Zulley J, et al. Prevalence and patterns of problematic sleep among older adolescents. *J Am Acad Child Adolesc Psychiatry*. 2000;39:1549-1556.
6. Johnson EO, Roth T, Schultz L, et al. Epidemiology of DSM-4 insomnia in adolescence: lifetime prevalence, chronicity, and an emergent gender difference. *Pediatrics*. 2006;117:E247-E256.
7. Gregory AM, Sadeh A. Sleep, emotional and behavioral difficulties in children and adolescents. *Sleep Med Rev*. 2012;16:129-136.
8. Ivanenko A, Crabtree VM, Gozal D. Steep and depression in children and adolescents. *Sleep Med Rev*. 2005;9:115-129.
9. Astill RG, Van Der Heijden KB, Van Ijzendoorn MH, Van Someren EJ. Sleep, cognition, and behavioral problems in school-age children: a century of research meta-analyzed. *Psychol Bull*. 2012;138:1109-1138.
10. Moore S, Singareddy R, Calhoun S, et al. Gastrointestinal symptoms are more common in young school aged children with sleep disturbances. *Am J Gastroenterol*. 2008;103:S531-S532.
11. Alfano CA, Ginsburg GS, Kingery JN. Sleep-related problems among children and adolescents with anxiety disorders. *J Am Acad Child Adolesc Psychiatry*. 2007;46:224-232.
12. Owens JA. The ADHD and sleep conundrum: a review. *J Dev Behav Pediatr*. 2005;26:312-322.
13. Accardo JA, Marcus CL, Leonard MB, et al. Associations between psychiatric comorbidities and sleep disturbances in children with attention-deficit/hyperactivity disorder. *J Dev Behav Pediatr*. 2012;33:97-105.
14. Stein MB, Belik SL, Jacobi F, et al. Impairment associated with sleep problems in the community: relationship to physical and mental health comorbidity. *Psychosom Med*. 2008;70:913-919.
15. Minde K, Faucon A, Falkner S. Sleep problems in toddlers—effects of treatment on their daytime behavior. *J Am Acad Child Adolesc Psychiatry*. 1994;33:1114-1121.
16. Lavigne JV, Arend R, Rosenbaum D, et al. Sleep and behavior problems among preschoolers. *J Dev Behav Pediatr*. 1999;20:164-169.
17. Coulombe JA, Reid GJ, Boyle MH, et al. Concurrent associations among sleep problems, indicators of inadequate sleep, psychopathology, and shared risk factors in a population-based sample of healthy Ontario children. *J Pediatr Psychol*. 2010;35:790-799.
18. Willoughby MT, Angold A, Egger HL. Parent-reported attention-deficit/hyperactivity disorder symptomatology and sleep problems in a preschool-age pediatric clinic sample. *J Am Acad Child Adolesc Psychiatry*. 2008;47:1086-1094.
19. Ohayon MM. Epidemiology of insomnia: what we know and what we still need to learn. *Sleep Med Rev*. 2002;6:97-111.
20. Goodman R. The strengths and difficulties questionnaire: a research note. *J Child Psychol Psychiatry*. 1997;38:581-586.
21. Dunn G, Pickles A, Tansella M, et al. Two-phase epidemiological surveys in psychiatric research. *Br J Psychiatry*. 1999;174:95-100.
22. Crone MR, Vogels AGC, Hoekstra F, et al. A comparison of four scoring methods based on the parent-rated strengths and difficulties questionnaire as used in the Dutch preventive child health care system. *BMC Public Health*. Apr 4;8:106.
23. Angold A, Costello EJ. The Child and Adolescent Psychiatric Assessment (CAPA). *J Am Acad Child Adolesc Psychiatry*. 2000;39:39-48.
24. Egger HL, Erkanli A, Keeler G, et al. Test-retest reliability of the Preschool Age Psychiatric Assessment (PAPA). *J Am Acad Child Adolesc Psychiatry*. 2006;45:538-549.
25. American Psychiatric Association. *Diagnostic and Statistical Manual for Mental Disorders*. 4th ed. Washington, DC: American Psychiatric Association; 1994.
26. Anders T, Eiben L. Sleep disorders. In: Zeanah C, ed. *Handbook of Infant Mental Health*. New York, NY: The Guilford Press; 2000:326-338.
27. Gaylor EE, Goodlin-Jones BL, Anders TF. Classification of young children's sleep problems: a pilot study. *J Am Acad Child Adolesc Psychiatry*. 2001;40:61-67.
28. Tucker ME. Insomnia, hypersomnia disorders criteria proposed for DSM-5. 2012. Available at: <http://www.clinicalpsychiatrynews.com/specialty-focus/sleep-disorders/single-article-page/insomnihypersomnia-disorders-criteria-proposed-for-dsm-5.html>. Accessed May 23, 2013.
29. Galland BC, Taylor BJ, Elder DE, et al. Normal sleep patterns in infants and children: a systematic review of observational studies. *Sleep Med Rev*. 2012;16:213-222.
30. Janson H, Olsson U. A measure of agreement for interval or nominal multivariate observations by different sets of judges. *Educ Psychol Meas*. 2004;64:62-70.
31. Wichstrom L, Berg-Nielsen TS, Angold A, et al. Prevalence of psychiatric disorders in preschoolers. *J Child Psychol Psychiatry*. 2012;53:695-705.
32. International Labour Office. *ISCO-88 International Standard Classification of Occupation*. Geneva, Switzerland: International Labour Office; 1990.
33. Gehrman PR, Meltzer LJ, Moore M, et al. Heritability of insomnia symptoms in youth and their relationship to depression and anxiety. *Sleep*. 2011;34:1641-1646.
34. Quach J, Hiscock H, Canterford L, et al. Outcomes of child sleep problems over the school-transition period: Australian population longitudinal study. *Pediatrics*. 2009;123:1287-1292.
35. Papadimitriou GN, Linkowski P. Sleep disturbance in anxiety disorders. *Int Rev Psychiatry*. 2005;17:229-236.
36. SaletuZyhlarz G, Saletu B, Anderer P, et al. Nonorganic insomnia in generalized anxiety disorder. I. Controlled studies on sleep, awakening and daytime vigilance utilizing polysomnography and EEG mapping. *Neuropsychobiology*. 1997;36:117-129.
37. Dahl RE, El-Sheikh M. Considering sleep in a family context: introduction to the special issue. *J Fam Psychol*. 2007;21:1-3.
38. Leahy E, Gradisar M. Dismantling the bidirectional relationship between paediatric sleep and anxiety. *Clin Psychol*. 2012;16:44-56.
39. Dahl RE. The regulation of sleep and arousal: development and psychopathology. *Dev Psychopathol*. 1996;8:3-27.
40. Robert JJT, Hoffmann RF, Emslie GJ, et al. Sex and age differences in sleep macroarchitecture in childhood and adolescent depression. *Sleep*. 2006;29:351-358.

41. Bertocci MA, Dahl RE, Williamson DE, et al. Subjective sleep complaints in pediatric depression: a controlled study and comparison with EEG measures of sleep and waking. *J Am Acad Child Adolesc Psychiatry*. 2005;44:1158-1166.
42. Schredl M, Pallmer R, Montasser A. Anxiety dreams in school-aged children. *Dreaming*. 1996;6:265-270.
43. Nielsen TA, Laberge L, Paquet J, et al. Development of disturbing dreams during adolescence and their relation to anxiety symptoms. *Sleep*. 2000;23:727-736.
44. Levin R, Fireman G, Spendlove S, et al. The relative contribution of affect load and affect distress as predictors of disturbed dreaming. *Behav Sleep Med*. 2011;9:173-183.
45. Levin R, Nielsen TA. Disturbed dreaming, posttraumatic stress disorder, and affect distress: a review and neurocognitive model. *Psychol Bull*. 2007;133:482-528.
46. Barlow DH. *Anxiety and Its Disorders*. New York, NY: Guilford Press; 2002.
47. Coolidge FL, Segal DL, Coolidge CM, et al. Disorder in childhood and adolescence have a common genetic origin? *Behav Genet*. 2010;40:349-356.
48. Alfano CA, Zakem AH, Costa NM, et al. Sleep problems and their relation to cognitive factors, anxiety, and depressive symptoms in children and adolescents. *Depress Anxiety*. 2009;26:503-512.
49. Wittchen HU, Kessler RC, Pfister H, et al. Why do people with anxiety disorders become depressed? A prospective-longitudinal community study. *Acta Psychiatr Scand*. 2000;102:14-23.
50. Statistics Norway. Children, 1 January 2011. 2011. Available at: <http://www.ssb.no/en/befolkning/statistikker/barn/aar>. Accessed May 24, 2013.
51. Statistics Norway. Earnings of all employees, 2012. 2012. <http://www.ssb.no/en/arbeid-og-lonn/statistikker/lonnansatt/aar/2013-03-20>. Accessed May 23, 2013.
52. Simola P, Niskakangas M, Liukkonen K, et al. Sleep problems and daytime tiredness in Finnish preschool-aged children-a community survey. *Child Care Health Dev*. 2010;36:805-811.
53. Smedje H, Broman JE, Hetta J. Parents' reports of disturbed sleep in 5-7-year-old Swedish children. *Acta Paediatr*. 1999;88:858-865.
54. Owens JA. Introduction: culture and sleep in children. *Pediatrics*. 2005;115:201-203.